

ECOLOGY OF VENOMOUS SPIDER *Latrodectus hasselti* THORELL, 1870 (ARANEAE:THERIDIIDAE) FROM SOLAPUR AND OSMANABAD DISTRICT, MAHARASHTRA

Hippargi, R.V.^{1*}, P. M. Bolde², S. V. Manthen³, A.R. Shaikh⁴

¹Dept. of Zoology, Walchand College of Arts & Science,
Solapur - 413 006 (appuratna@rediffmail.com)

²Dept. of Electronics and telecommunication, A.G. Patil Institute of technology,
Solapur - 413 008 (prasad141990@gmail.com)

³Dept. of Zoology, D.B.F. Dayanand college of Arts and Science,
Solapur - 413 003 (shripadmanthen@gmail.com)

⁴Dept. of Zoology, Shree Shivaji Mahavidhyalaya, Barshi - 413
(akbar.shaikh261990@rediffmail.com)

ABSTRACT

Spiders belonging to genus *Latrodectus* are well known as spiders of medical importance, as they present a real envenomation threat to humans leading to mild and sometimes severe pathological manifestations referred as latrodectism. Primary goals of this study were to gather baseline data on the distribution, population, behavior and breeding biology of *Latrodectus hasselti* from grassland ecosystem of Solapur and dry deciduous forest from Yedshi Ramling Sanctuary, Osmanabad. Marked seasonal variation was observed in the abundance, distribution and breeding with higher preference for grassland ecosystem. Preliminary observation on the breeding biology was carried out on a female reared in vivarium. Such surveys are vital for conservation of these creatures.

Key words: Ecology, *Latrodectus hasselti*, Solapur

INTRODUCTION

Solapur region is presently one of the most rapidly developing areas in Maharashtra. Previously it was purely a traditional agriculture area with ample virgin grassland and Southern Tropical Thorn Forest cover with very less industrialization or urbanization. But in recent times this region has experienced intense urbanization and industrialization. Ecosystem of Solapur region is under high peril of complete annihilation owing to unsustainable human activities. In this regards, it's very vital to improve upon the knowledge on biodiversity of Solapur region in order to develop proper conservation strategies and bio-monitoring systems. A major action strategy implemented for environmental conservation involves establishment of biological monitoring systems, Reaka-Kundla *et al.* (1997). Such programs usually identify environmental disturbances in a given ecosystem using selected group of organisms called bioindicators, Garg and Hippargi (2007). Spiders are good indicators of environmental health. They play important roles in the dynamics of grassland, and are sensitive to habitat loss, climatic change and environmental upheavals.

Given the significance of spiders belonging to genus *latrodectus* in medical science and there synanthropic associations it is quite surprising that the information pertaining to population, distribution, behavior and life history of these spiders are poorly documented. Very little is known about the population and ecology of *Latrodectus* from grassland ecosystem of Solapur and adjoining Osmanabad region of Maharashtra. Previous reports on the occurrences of *L. hasselti* from India include sightings from Pune and Thane area of Mumbai, Maharashtra (Simon, 1897; Pocock, 1900 and Daniel and Soman, 1961), Vadodara, Baroda district, Gujarat (Siliwal and Kumar, 2001) and Vadavalli, Coimbatore, Tamilnadu (Kumar and Siliwal, 2005). Recent published records of this species very few and demand further investigation into their ecology and distribution from various habitats. Developmental biology of *Latrodectus* is studied for species occurring in America (Kaston, 1970). Postembryonic development of *L. hasselti* was studied in Australia (Softly and Freeth, 1970). Detailed studies based on field and laboratory observations are scarce.

The spider species belonging to genus *Latrodectus* (black widow spider, Theridiidae) is proved to be most dangerous and is widely feared by humans due to their known ability to inflict very painful and occasionally potentially deadly bites when contacted accidentally. Although bites from black widows are relatively rare, and the toxicity of their neurotoxic venom varies widely, envenomation by these spiders can be dangerous. A mild to severe medical condition known as *latrodectism* is caused due to envenomation of black widow spider. The systematic symptoms of latrodectism include severe localized pain which later becomes generalized, severe muscular pain, swelling of the lymphatic nodes, profuse sweating, and rigidity of the abdominal muscles, facial contortions, and hypertension (Maretic, 1983). Although death is rare, mortality can be 4-5% without treatment. There are no records

We present herewith, one year observations on the population, distribution, breeding ecology and behavior of *L. hasselti* from two habitats and we also provide preliminary observations on breeding biology of a *L. hasselti* reared in the laboratory studies for three months.

MATERIALS AND METHODS

Study Sites:

Surveys for the ecological studies were carried out from January 2009 up to December 2011 at some selected grassland patches covering an area of 30 kms surrounding Great Indian Bustard Sanctuary, Nannaj, Solapur (17°49'29.80"N 75°52'18.14"E) and Yedshi Ramling Wildlife Sanctuary located 110 kms from Solapur (18°18'59.08"N 75°55'2.12"E). The biogeographic zone of Solapur area is 6 B (Deccan Peninsula-Central Plateau) and the forest type in this ecoregion is mostly Southern Tropical Thorn Scrub, as defined by Champion and Seth (1968). Ramling Wildlife Sanctuary is dominated with dry deciduous forest.

Survey Methodology:

Collecting methods mostly included monthly active searches in five 10 x

10m quadrates from both study sites. Detailed account on the locality, habitat, date of observation, and photographs of the specimen and egg sac (Fig. 1 and 2) in life were recorded (Table:1). Few specimens were collected from wild with permission of the state wildlife department for the identification. The specimens were preserved in 75% ethanol and identified using stereo zoom microscope with illustration and description as provided by Pocock (1900). Currently the specimens are in the custody of Zoology Department of Walchand College of Arts & Science, Solapur, which will be deposited in due course of time with Zoological Survey of India, Pune regional station, Pune.

Rearing of *L. hasselti* in vivarium for studying breeding biology:

Preliminary breeding biology of *L. hasselti* was studied in a rectangular plastic vivarium of size 15 L x 15 B x 10 H cm. The vivarium was provisioned with a bed of dried twig and pieces of rocks and pebbles to provide natural environ. The female specimen was procured from natural habitats around Solapur and was kept in the vivarium for three months. The spider was fed on daily basis with ants, grasshoppers, and beetles. Details pertaining to duration for egg laying, hatch times, number of spiderlings were recorded (Table. 2)

Statistical analysis:

The one year field data and three months laboratory data on population and breeding biology was analyzed statistically using PAST© software (Hammer *et al.*, 2001).

RESULTS

Population, breeding records, and behavior of *L. hasselti* from two study sites:

A total of 31 sightings (mean value 2.58) of *L. hasselti* were made at study sites from the grassland ecosystem around Great Indian Bustard Sanctuary, Nannaj Solapur compared to only 07 sightings (mean value 0.58) at dry deciduous forest from Yedshi Ramling Sanctuary, Osmanabad, indicating higher preference towards grassland ecosystem. 24 egg sacs were observed from grassland ecosystem with breeding records spanning monsoon and winter season. Egg sacs were not reported from Yedshi Ramling Sanctuary in any season. At all study sites the specimens were always observed under medium sized stones, with marked preference for short grass with exposed rocky areas with near partial human activity. The specimens never showed any signs of aggressive behavior even with repeated handling and always remained shy and reclusive and tried to hide beneath the stone.

Notes on preliminary breeding biology of *L. hasselti* in Vivarium set-up:

The breeding data for three months beginning with first egg laying incidence and all successive events till successive emergence of spiderlings from egg sacs are systematically observed and noted (Table:2). A total of 8 egg sacs were laid during the experimental set up requiring an average 4.75 days for successive laying

Table:1, Monthly population and breeding data of *L. hasselti* during period

Month	Number of <i>L. hasselti</i> sighted at Nannaj Sanctuary	Total Number Egg Sacs	Number of <i>L. hasselti</i> sighted at Yedshi Ramling Sanctuary	Number of Egg Sacs
Jan-2009	02	07	00	00
Feb-2009	04	03	00	00
Mar-2009	02	00	02	00
Apr-2009	00	00	00	00
May-2009	00	00	00	00
June-2009	03	00	01	00
July-2009	06	02	02	00
Aug-2009	04	09	00	00
Sept-2009	03	00	01	00
Oct-2009	03	00	01	00
Nov-2009	02	00	00	00
Dec-2009	02	03	00	00
TOTAL	31	26	07	00
Mean	2.58	2.16	0.58	00

Table:2, Observations on Breeding Biology in Vivarium set-up in laboratory conditions:

Date on which <i>L. hasselti</i> was introduced into vivarium	Date of laying of egg sacs	Days required for successive laying of egg sacs	Date of hatching	Number of Juveniles	Number of days required for hatching
4.8.2011	05.8.2011	00	23.8.2011	125	19
	09.8.2011	04	29.8.2011	120	21
	13.8.2011	04	03.9.2011	135	22
	22.8.2011	08	11.9.2011	129	21
	29.8.2011	07	19.9.2011	123	22
	07.9.2011	05	26.9.2011	132	20
	12.9.2011	05	02.10.2011	122	21
	17.9.2011	05	11.11.2011	127	25
Total		38		1013	171
Mean		4.75		126.62	21.37

of egg sacs. An average of 21.37 days was required for successful hatching with a mean value of 126.62 spiderlings per egg sac. Spiderlings were released safely in their natural habitat after each hatching event.



Fig. 1. *L. hasselti* in life



Fig. 2. *L. hasselti* with egg sacs

CONCLUSIONS

The study reveals that the abundance of these spiders was higher in the partially disturbed patches of grassland and is relatively low at the dry deciduous forest at the Yedshi Ramling Sanctuary, Osmanabad. However, it always preferred partially disturbed and exposed rocky patches at both sites. The breeding activity

begins with the onset of monsoon. The maximum numbers of egg sacs recorded in natural habitat was 09, which is closer to a maximum of 08 egg sacs recorded in vivarium set up in the laboratory. Our observations clearly emphasizes that *L. hasselti* is quite well distributed at both study sites and active throughout the year excepting during summer period. Breeding activity in grassland ecosystem was observed mainly during July and August during monsoon and December-February during winter season. Number of sightings of *L. hasselti* decreased with increasing temperature during summer season. Majority of previous distributional records of *L. hasselti* from India were based on sightings of single specimen, but, our study proves that it is quite common and well distributed.

REFERENCES

- Champion, H.G and S.K. Seth. 1968. A Revised Survey of Forest Types of India, *Government of India Press, New Delhi*. 402pp.
- Daniel, J.C. and P.W. Soman. 1961. Observations on the spider *Latrodectus hasselti indicus* Simon with a note on arachnidism. *J. Bombay Nat. Hist. Soc.* 8(3):823-826.
- Garg, A. D. and R. V. Hippargi. 2007. Significance of frogs & toads in environmental conservation. Pp. 80-85. In: S. M. Gadegone et al. (eds.), *Souvenir of National Seminar on Eco-Environmental Impact and Organism response*. Nagpur, India. Kamla Nehru Mahavidyalaya.
- Hammer, Ø.; D.A.T. Harper and P. D. Ryan. 2001. PAST: Paleontological Statistics Software Package for Education and Data Analysis. *Palaeontologia Electronica* 4(1): 9pp.
- Kaston, B. J. Comparative biology of American black widow spiders. *Trans. San Diego Soc. nat. Hist.* 16: 33-82.
- Maretic, Z. 1983. Latrodectism: variations in clinical manifestations provoked by *Latrodectus* species of spiders. *Toxicon*. 21: 457-466.
- Reaka-Kundla, H. L.; D.E. Wilson and E.O. Wilson. 1997. Biodiversity II: Understanding and protecting our biological resources. *Washington D. C. Joseph Henry Press*. 560pp.
- Pocock, R.I. 1900. *Fauna of British India, Arachnida*. Taylor and Francis, London
- Siliwal, M. and D. Kumar. 2001. Rare sighting of poisonous spider *Latrodectus hasselti indicus* Simon (Araneae: Theridiidae) in a cotton field in Baroda district, Gujarat. *Curr. Sci.* 18(9): 1170-1171.
- Kumar, G. and M. Siliwal. 2005. Range extension of *Latrodectus hasselti* Thorell, 1870 (Araneae: Theridiidae). *Zoos's Print J.* 20(11): 2072
- Simon, E. 1897. Arachnides recueillis par M.M. Maindron a Mascate, en octobre 1896. *Bulletin du Museum (national) d'histoire naturelle*, Paris. 1897: 95-98.
- Softly, A. and G. E. Freeth. 1970. The laboratory maintenance of *Latrodectus mactans*. *J. Inst. Anim. Tech.* 21 :117-126.